

DataTurbine Activities at NASA

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Overview

- **NASA Dryden Business: Flight Testing and Airborne Science**
 - Focus here on Earth science applications customers (~5 yrs)
- **Brief look at DataTurbine-based systems at Dryden**
- **Status & Plans**
- **Show video clip of recent mission monitor application**



DC-8

Core Aircraft for Medium Altitude, Heavy Lift

Capabilities

- Ceiling 42,000 ft.
- Duration 12 hours
- Range > 5,400 nautical miles
- Payload 30,000 lbs
- 4 CFM56-hi-bypass turbofan engines

Mission Support Features

- Shirtsleeve environment for up to 30 scientist/investigators
- worldwide deployment experience
- Extensive modifications to support in-situ and remote sensing instruments
 - zenith and nadir viewports
 - wing pylons
 - modified power systems
 - 19 inch rack mounting
 - **extensive on-board data acquisition system and on-board experiment network**



Background and Status

- Acquired by NASA in 1986
- Long history of supporting studies in archaeology, astronomy, ecology, geology, hydrology, meteorology, oceanography, volcanology, atmospheric chemistry, soil science and biology
- Aircraft operations transferred to Dryden Flight Research in August, 2007

ER-2

Core Aircraft for Very High Altitude

Capabilities

- Ceiling > 65,000 ft
- Duration > 10 hours
- Range > 4,000 nautical miles
- Payload 2,600 lbs (700 lbs in each wing pod)
- GE F-118 Turbofan

Mission Support Features

- World-wide deployment experience
- Multiple locations for payload instruments
- Pressurized and un-pressurized compartments
- Standardized cockpit control panel for activation and control of payload instruments
- **Iridium communications system with instrument interaction capabilities**



Background and Status

- U-2 and ER-2 aircraft have been a mainstay of NASA airborne sciences since 1971
- Over 100 science instruments integrated
- Continuous capability improvements
- Two aircraft currently available for:
 - Remote sensing
 - Satellite calibration/validation
 - In-situ measurements and atmospheric sampling
 - Instrument demonstration, test and evaluation

P-3B Orion Heavy Lift, Core Aircraft

Capabilities

- Ceiling 30,000 ft.
- Duration 12 hours
- Range 3,800 nautical miles
- Payload 16,000 lbs
- 4 Allison T56-14A turbo-prop engines



Mission Support Features

- Shirtsleeve environment, ≤ 18 scientists
- worldwide deployment experience
- Extensive modifications to support in-situ and remote sensing instruments
 - zenith and nadir viewports
 - modified power systems
 - 19 inch rack mounting



on-board data acquisition network

Background and Status

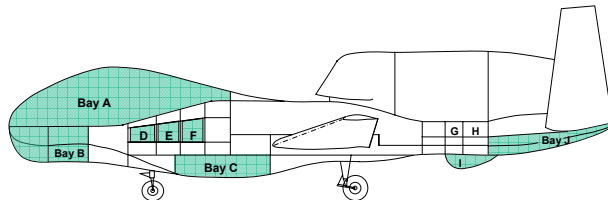
- Acquired by NASA in 1991, operational for science in 1993
- Long history of supporting studies in geology, hydrology, meteorology, biological oceanography, physical oceanography, atmospheric chemistry, and cryospheric sciences
- Frequently used by Instrument Incubator Program investigators

Global Hawk

New Capability for Very Long Endurance, High Altitude

Capabilities

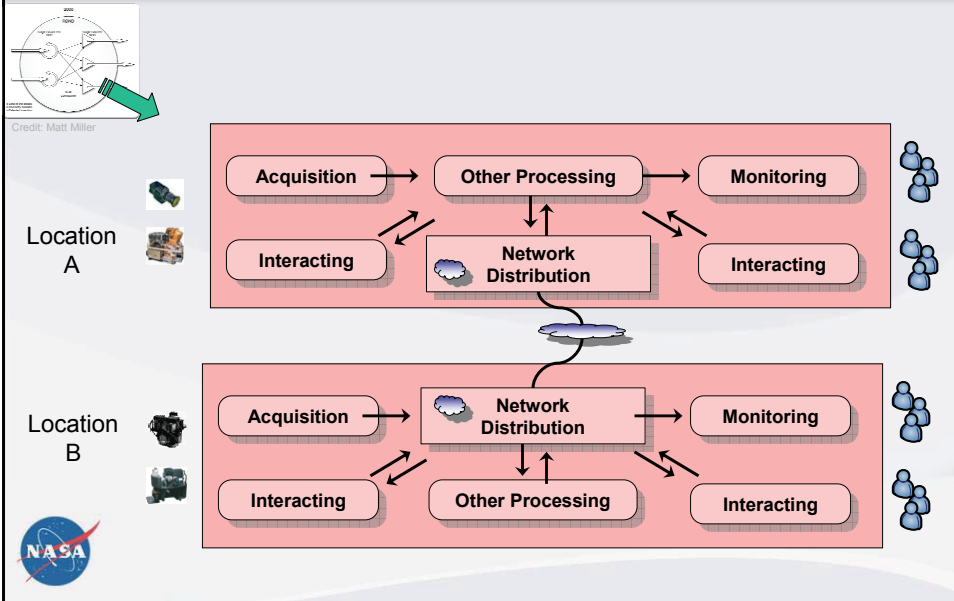
- Endurance > 30 hours
- Range > 11,000 nmi
- Altitude 65,000 ft
- Payload > 1,500 lbs
- DC Power 2.0 KW
- AC Power 8.3 KVA



Mission Support Features

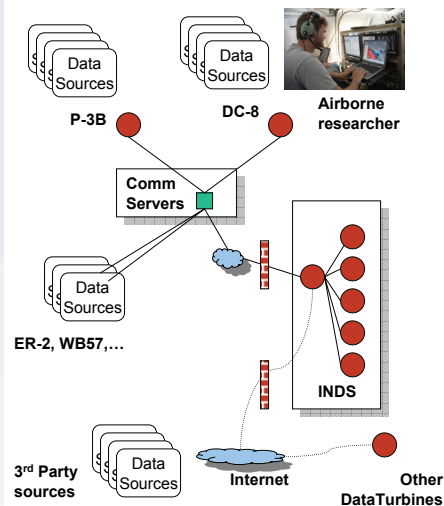
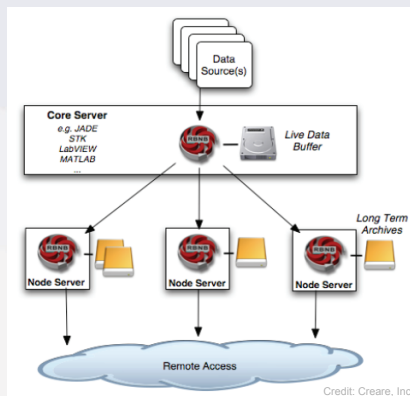
- Multiple payload locations.
 - Pressurized and un-pressurized.
 - Can accommodate wing pods (future).
- **REVEAL system with ethernet network on the aircraft**
- Fully autonomous control system, take-off to landing
- Redundant LOS and BLOS aircraft command and control comm links
- Redundant BLOS ATC comm links

Network-Distributed Test/Measurement

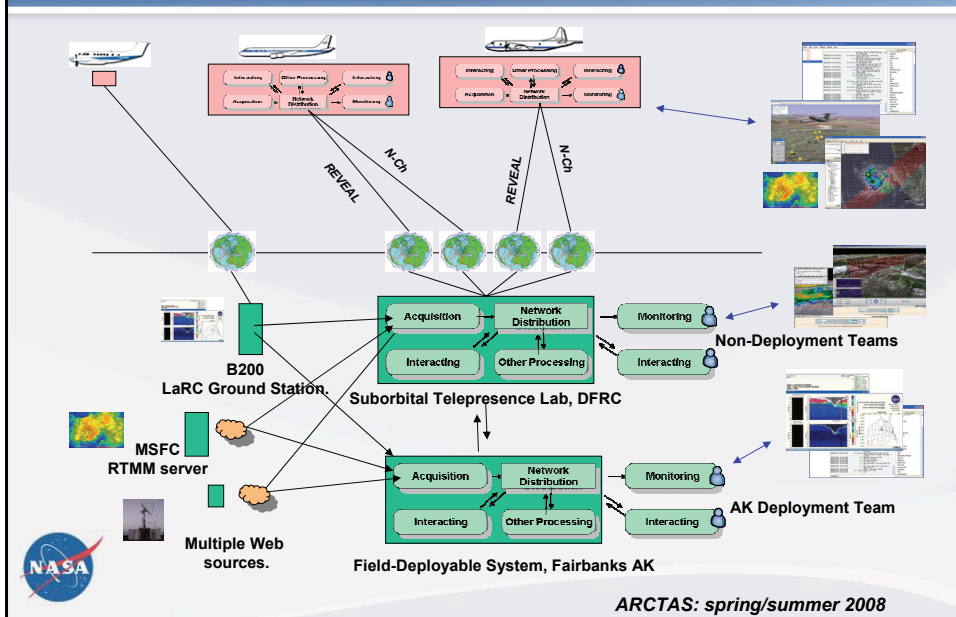


Global Test Range Intelligent Network Data Server

- Prototype for operational infrastructure (< 2 yrs old)



Sensor Web Notional Architecture

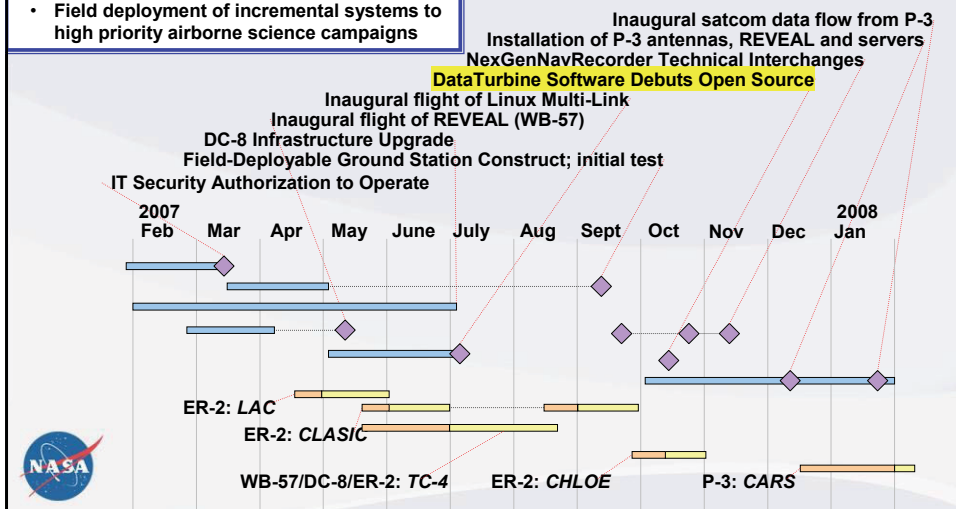


Year-at-a-Glance

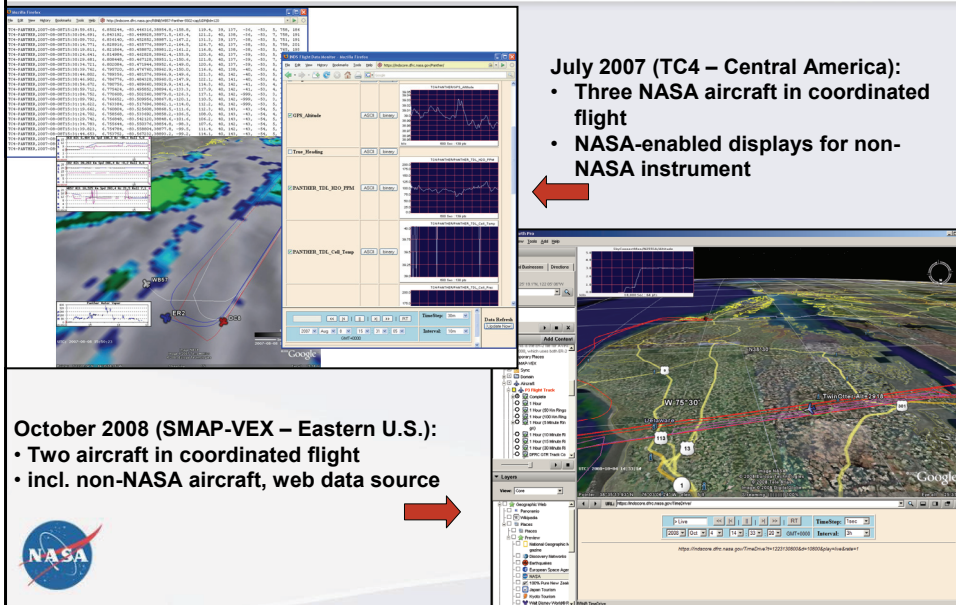
Development Highlights and Milestones during 2007

Working toward a robust, operational capability by 2010 through:

- Incremental development
- Field deployment of incremental systems to high priority airborne science campaigns



Typical Examples



Status and Plans

- DataTurbine-based INDS system comprise core data management in Dryden's ground station
- Two heavy-lift platforms also have DataTurbine servers to support onboard computing needs
- Five years of use in support of airborne science builds on DataTurbine involvement since inception 1995.
- Operational transition planning now in progress
 - New systems at DFRC (Global Hawk, emergency Ops, Data Center)
 - Redesign Global Test Range Development Lab (dev/production)
- Deploy first operational systems 2010
- Explore/advocate propagation across Agency.
 - Vehicle health management; space-related applications



